European Journal of Radiology 74 (2010) 508–513

Contents lists available at ScienceDirect

European Journal of Radiology

journal homepage: www.elsevier.com/locate/ejrad

Mammography and breast sonography in transsexual women

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ARTICLE INFO

Article history:
Received 10 January 2009
Received in revised form 9 March 2009
Accepted 12 March 2009

Keywords:
Breast ultrasonography
Mammography
Transsexualism

ABSTRACT

Data on the necessity of performing screening mammographies in transsexual women are lacking. The main objective of this study was to assess the possibility to perform mammography and breast sonography in transsexual women.

Fifty Dutch-speaking transsexual women were interviewed about the following: attitude towards mammography and breast sonography, importance attributed to and satisfaction with breast appearance, opinion about the necessity of breast check-up, expectations regarding discomfort during the exams and knowledge about the breast surgery. A fasting blood sample, clinical breast exam, mammography and breast sonography were performed. At mammography the following parameters were noted: density, technical quality, location of the prostheses, presence of any abnormalities and painfulness. At sonography the following parameters were recorded: density, presence of cysts, visualisation of retro-areolar ducts or any abnormalities.

Twenty-three percent of patients are not aware of the type of breast implants and 79% do not know their position to the pectoral muscles. Patient satisfaction with the appearance of their breasts was rather high (7.94 on a scale of 0–10). Mean expected and experienced pain from mammography was low (4.37 and 2.00 respectively). There was no statistically significant difference in expected pain between those who already had mammography and those who did not. There was a significant positive correlation between the expected and the experienced pain.

Mammography and breast sonography were technically feasible and no gross anomalies were detected. Since both exams were judged as nearly painless, 98% of transsexual women intended to come back if they would be invited. Since breast cancer risk in transsexual women is largely unknown and breast exams are very well accepted, breast screening habits in this population should not differ from those of biological women.

1. Introduction

Gender identity disorder is a condition in which a person has been assigned one gender but identifies as belonging to another gender and feels significant discomfort about this or is unable to deal with this condition.

Transsexualism is the most extreme form of gender identity disorder (GID) and will typically require sex reassignment surgery (SRS). In transsexual women SRS consists of removal of the male reproductive organs (testes and penis), creation of a neovagina and -clitoris and, since hormonal breast development is usually insufficient, in most patients implantation of breast prostheses. Surgery however is always preceded by extensive counselling by a psychiatrist and long-term hormonal therapy. Moreover gender dysphoric patients are only allowed to undergo definitive SRS after succeeding the 'real-life experience': the patient has to live for at least 1 year in his new sex identity.

In male-to-female transsexual individuals (transsexual women) endocrinological feminization is achieved by suppression of androgen effects followed by induction of female physical characteristics [1]. In our centre, suppression of androgenic effects is achieved by the anti-androgen cyproterone acetate, while estrogen is the principal agent used to induce female characteristics [2]. One of the desired effects of estrogen therapy is gradual growth of breast tissue. The latter effect is however highly variable, this is some patients will hardly develop some breast buds even after years of estrogen therapy while others have full breast development after 1–2 years.

Data on the necessity of performing screening mammographies in transsexual women are lacking. In one publication, mammogra-

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doi:10.1016/j.ejrad.2009.03.018

phy is recommended after 10 years of hormonal therapy for women older than 40 [3]. Another report advises screening mammography from the age of 50 in the presence of additional risk factors [4], but evidence from prospective studies is lacking.

In this study a follow-up investigation of 50 patients post-SRS was carried out. The primary objective of this study was to assess the possibility to perform mammography and breast sonography in transsexual women. Secondary objectives were the following: to describe any clinical, radiologic and/or ultrasonographic abnormalities, to analyse the expected and experienced discomfort of mammography and to assess the acceptance of breast exams by transsexual women.

2. Materials and methods

2.1. Patient population

Since the inception of the gender team at Ghent University Hospital, we performed SRS in over 300 male-to-female transsexuals, the last 5 years at an average rate of 30 cases a year. For the present study, Dutch-speaking transsexual women who had a minimal interval of 6 months since SRS and who consulted one of the members of the gender team for treatment or follow-up during the past 12 months were invited to participate ($n = 70$). After 4 weeks a participation rate of 50/70 (71%) was reached and no further efforts were made to increase the sample size.

2.2. Study procedures

Following written and oral informed consent, all women who agreed to participate completed the entire study protocol between March and June 2007.

Before the start of the examinations, a study nurse interviewed the patients about their attitude towards mammography and breast sonography, presence of breast tenderness, their expectations regarding discomfort during the different exams (scored on visual analogue scale (VAS) from 0 to 10) and their knowledge about breast surgery. The latter was compared with the information gathered from the files. They were also asked for the importance attributed to and satisfaction with their breast appearance (VAS from 0 to 10). All participants also filled in extensive questionnaires concerning general, mental and sexual health, of which the results were published earlier [5]. A fasting blood sample was taken for serum testosterone, estradiol and Prostate Specific Antigen (PSA) assessment. Subsequently, breast palpation, mammography and breast sonography were performed.

Breast palpation was performed by a single gynecologist, who is member of the gender team. Symmetry of the breasts, nipple retraction, ptosis and palpatory findings were recorded.

All mammograms were obtained in a clinical mammographic unit (Senographe DMR, GE Medical Systems, Milwaukee, Wisconsin), using standard craniocaudal and oblique views, supplemented with Eklund views if needed for optimal breast tissue evaluation [6]. Breast sonographies were performed using a high-end ultrasound machine (EUB-8500, Hitachi Medical Systems, Zug, Switzerland), with a 92 mm wide 5–10 MHz linear probe with integrated water-path stand-off for radial ductal sonography, and a 38 mm wide 6–14 MHz linear probe for additional high-detail imaging. Patients were imaged supine, with the arms elevated above the head.

Mammography and breast sonography were performed by a single experienced independent radiologist. Mammographic density was scored on a scale from 0 to 3: 0 = translucent, 1 = dense glandular tissue in less than 25% (slightly dense), 2 = dense tissue in 25–60% (dense) and 3 = dense tissue in more than 60% of the mammogram (very dense). The technical quality of the mammography in *cranio-caudal* (CC) and *oblique* (OBL) incidence was rated from 'underexposed' over 'good' to 'overexposed'. The location of the prostheses (retropectoral or prepectoral) was recorded and any abnormalities were described. Sonographic abnormalities were recorded and the sonographic density was scored on a scale from 0 to 3: 0 = isoechoic to fatty tissue (fatty), 1 = scattered slightly hyperechoic retro-areolar streaks (slightly echodense), 2 = heterogeneous hyperechoic glandular tissue (echodense) and 3 = homogeneous hyperechoic glandular tissue (very echodense). The visualisation of the retro-areolar ducts and the presence of cysts were recorded.

After the mammography the painfulness of this procedure was assessed once by the radiologist and once by an independent study nurse using a VAS score.

This study complies with the recommendations of the Declaration of Helsinki and was approved by the Ethical Committee of our institution under number 2006/375.

2.3. Data analysis

Distributions of continuous variables were summarized through their measures of central tendency and dispersion, i.e. mean and standard deviation if the parametric assumption was retained following the one-sample Kolmogorov–Smirnov test, either median and interquartile range (P25–P75) for non-normally distributed variables.

Correlations were assessed through Pearson's correlation or through Spearman's rank correlation coefficient. Differences between means were explored through Student's *t*-test. Statistical significance was accepted if the two-tailed probability level was <0.05. All analyses were performed with the statistical software SPPS v15.0 (Chicago, IL).

3. Results

3.1. Study population characteristics

The main characteristics are summarized in Table 1. Two patients had no augmentative breast surgery since hormonally

Table 1
Patient characteristics, satisfaction and attitudes towards breast exams.

Age—years (mean ± SD)	43.06 ± 10.42
Body mass index—kg/m^2 (mean ± SD)	25.30 ± 5.37
Family history breastca	6 (12%)
Estrogen therapy	47 (94%)
Interval exam/vaginoplasty—months (median, IQ range)	49.50 (29.25–106.75)
Interval exam/breast augmentation—months (median, IQ range)	47.50 (30.25–86.00)
Testosterone—ng/dl (median, IQ range)	29.57 (21.45–38.24)
Estradiol—pg/dl (median, IQ range)	49.13 (28.61–96.17)
PSA—ng/ml (median, IQ range)	0.0300 (0.0300–0.0815)
Breast tenderness	21 (42%)
Severity breast tenderness on VAS (mean ± SD)	3.90 ± 1.97
Ever had mammography	10 (20%)
Importance attributed to breast appearance on VAS (mean ± SD)	8.84 ± 1.25
Satisfaction with breast appearance on VAS (mean ± SD)	7.94 ± 2.28
Think regular breast check-up is necessary (when asked before exams)	40 (80%)
Would come back for mammography if invited (when asked after exams)	49 (98%)
Expected painfulness of mammography on VAS (mean ± SD)	4.37 ± 2.92
Expected painfulness of breast sonography on VAS (mean ± SD)	2.77 ± 2.43
Experienced pain at mammography on VAS (mean ± SD)	2.00 ± 2.26
Experienced pain at breast sonography on VAS (mean ± SD)	0.50 ± 1.23

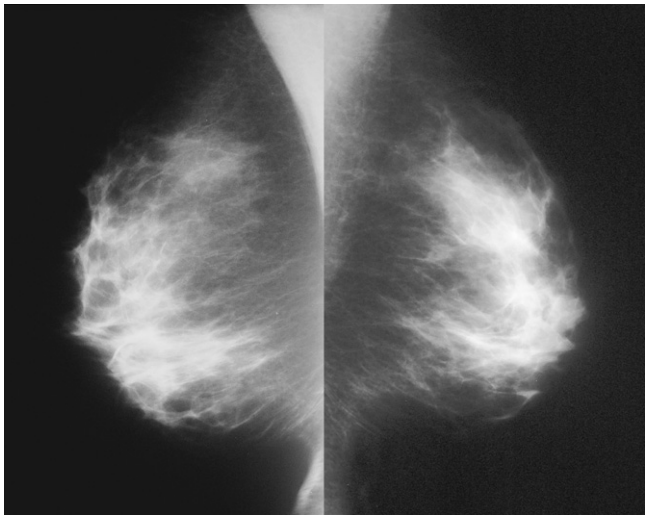

Fig. 1. Mammography of a transsexual woman without prostheses.

induced breast development was satisfactory (Fig. 1). Although in most women breast and genital surgery was combined in the same operative time, this was not the case in 15/48 (31.3%). The vast majority of transsexual women were on estrogen replacement therapy, the three women not taking any estrogens had important contra-indications (history of thrombosis). Only 2 patients were taking anti-androgens (cyproterone acetate 10 mg).

Twenty-one women experience episodes of breast tenderness (42%), 17 (34%) of whom once a month or more. The severity of this breast tenderness has a mean score of 3.90 (±1.97) as self-scored by the patient on a visual analogue scale (VAS). One in 5 patients indicated having already had mammography. Three of them were above 50 years old and mammography took place within the framework of the regional screening programme. The reasons for mammography in the other 7 were diverse: pain ($n = 3$), suspicion of rupture of the prostheses ($n = 1$) and anxiety ($n = 3$).

To minimize any selection bias we reviewed the surgical and psychiatric files of those patients not participating in this study: there was no statistical difference in age, surgical or psychiatric morbidity compared to the 50 participants.

3.2. Patient knowledge about the surgery

Thirty-eight in 48 patients (79%) said not to know the location of the prostheses, one thought they were placed in a prepectoral and 9 in a retropectoral location. Eleven (23%) patients did not know which type of prostheses was used, 27 (56%) indicated they were silicone-filled while the remaining 10 thought they were saline-filled. Afterwards the following information was gathered from the files: from 14 patients (29%) information on the place of the prostheses was lacking (operated elsewhere or not in file), in 32 (94%) they were placed in a retropectoral, in 2 (6%) in a prepectoral location. The 1 patient who thought to have prepectoral prostheses was wrong, the 9 others truly thought they were placed in a retropectoral location. From 9 patients (19%) information on the type of prostheses used was lacking, in 34 silicone-filled prostheses (87%) were used while 5 were saline-filled. From 7 of the 27 patients indicating they had silicone prostheses we found no information on the prostheses in the file, the other 20 were right about the type. From 2 of the 10 who thought they had saline-filled prostheses, we found no information, 5 of the remaining 8 were right (63%) while 3 in fact had silicone-filled prostheses. The median volume of the breast prostheses was 300 ml (interquartile (IQ) ranges 260–380).

3.3. Patients satisfaction with breast appearance and attitudes towards mammography and breast sonography

When asked for the score (on a VAS from 0 to 10) they would attribute to the importance and the satisfaction of the appearance of their breasts they gave mean scores of 8.84 (±1.25) and of 7.94 (±2.28) respectively. When asked for before undergoing the exams forty women (80%) thought that a regular breast check-up is necessary and 45 (90%) would come for invited mammographic screening.

The mean 'expected pain' for the mammography was 4.37 (±2.92) on a 0–10 scale while it was 2.77 (±2.43) for sonography. Women who already had mammography in the past indicated a mean expected pain score of 3.60 (±3.47) and 2.60 (±3.03) for mammography and breast sonography respectively while this was 4.56 (±2.79) and 2.81 (±2.29) for those who never had these exams. These differences in expected pain were not statistically significant for mammography, though marginally significant for sonography ($p = 0.4$ and 0.056, respectively).

3.4. Clinical breast exam

In 43 patients (86%) breasts were judged symmetrical by the clinician, in only 1 patient there was large asymmetry. Nipple retraction was absent in all patients, while there was significant ptosis of one or both breasts in 10 transsexual women (20%). In 5 patients breasts were judged "hard" on palpation, the remaining 45 (90%) were "rather supple" to "very supple". In 1 patient on palpation a small (3 cm) thoracal soft tissue mass lateral to the breast was found. The clinical aspects of this mass were suggestive for a lipoma.

3.5. Mammography and breast sonography

Table 2 summarizes the main results of mammography and breast sonography.

In 11 patients the breasts were judged very dense (22%), in 19 (38%) "dense", in 11 "slightly dense" (22%) while the remaining 9 (18%) were "translucent". There was no correlation between the density of the breast tissue and estrogen levels ($p = 0.390$).

The technical quality of the mammography in *cranio-caudal* (CC) *incidence* was rated 'good' in 31 women (62%), 12 were 'underexposed' (24%) while the remaining 7 were 'overexposed' (14%) (Fig. 2). The quality of the *oblique* (OBL) *incidence* was rated 'good' in 35 (70%), 'underexposed' in 6 (12%) and 'overexposed' in 9 (18%). Movement artefacts were present in only 1 patient, none of the patients had disturbing scar tissue. In 2 patients an abnormality was detected (4.2%): 1 patient had empty prostheses (patient was acquainted with it) and in the other a fibro-adenoma was detected.

Table 2
Results mammography and breast sonography.

Breast density on mammography	Very dense	11 (22%)
	Dense	19 (38%)
	Slightly dense	11 (22%)
	Translucent	9 (18%)
Technical quality mammography CC incidence	Good	31 (62%)
	Underexposed	12 (24%)
	Overexposed	7 (14%)
Technical quality mammography OBL incidence	Good	35 (70%)
	Underexposed	6 (12%)
	Overexposed	9 (18%)
Breast density on breast sonography	Very dense	1 (2%)
	Dense	18 (36%)
	Slightly dense	13 (26%)
	Translucent	18 (36%)

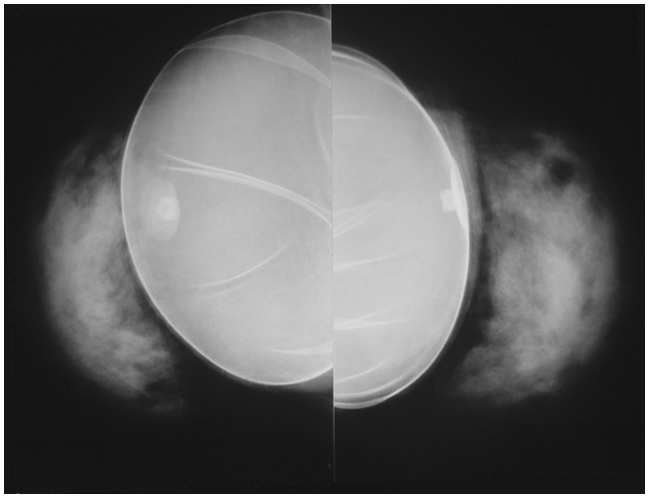

Fig. 2. Mammography showing good technical quality in a transsexual woman with prostheses.

The location of the prostheses as visualized on mammography was the following: 2 patients had none, in 2 patients the prostheses were prepectoral, the remaining 46 were retropectoral (96%).

All correlations are summarized in Table 3. The technical quality of the CC views is significantly correlated with that of the OBL ones. There is a significant correlation between the volume of the prostheses and the technical quality of the CC incidence with a higher volume leading to more overexposure. This is not the case in the OBL incidence. There is no significant correlation whatsoever between the location of the prostheses according to the patient and the real location of the prostheses as interpreted on mammography. In all 32 patients from whom information on the place of the prostheses could be retrieved from the medical file the location as judged on mammography was concordant.

Sonographic density was equally scored by the radiologist. In only 1 patient the breasts were very echodense (2%), 18 were judged "dense" and 18 "fatty" while the remaining 13 were "slightly dense". There is a significant correlation between the density on mammography and on sonography. In 5 patients (10%) the retroareolar ducts were visible on breast sonography, all of these ducts were ≤2 mm. In 5 patients (10%) cysts were present, all were <5 mm. There is no correlation between the presence of cysts and serum estradiol concentrations. In 5 patients abnormalities (other than small cysts) were visualized: 1 patient had a fibroadenoma (Fig. 3), two had a lipoma, in 1 patient both prostheses were empty while in another rupture of one of the prostheses was suspected.

Mean pain score of the mammography as self-rated on a VAS when asked for by the radiologist was 1.70 (±2.11) while it was 2.00 (±2.26) when asked for by the study nurse. There is a significant correlation between the expected painfulness of mammography and the experienced pain as scored by the patient when asked for by the study nurse. The experienced pain is with marginal significance inversely correlated with the volume of the prostheses however not with their location nor with the mammographic density. As expected breast sonography was rated nearly painless (0.50 ± 1.23).

At the end of these exams patients were asked for their intention to return for a screening mammography if invited: 49 women (98%) responded positively (compared to 90% when asked before undergoing the exams).

Table 3
Correlations mammography and breast sonography.

		Mammo quality CC	Mammo quality OBL	Location prostheses on mammo	Mammo density	Breast sono-graphic density	Presence of cysts	Location prostheses according to patient	Volume of prostheses	Expected pain mammo	Experienced pain mammo
E2 (pg/dl)	CC****	−271	−093	176	126	200	−215	−056	−152	−037	099
	Sig.***	057	522	220	383	163	134	703	356	800	494
Experienced pain mammo	CC	−052	−120	126	113	080	−112	120	−319*	392**	1000
	Sig.	720	405	382	434	579	439	415	048	005	
Expected pain mammo	CC	−082	−066	089	110	−090	093	124	−186	1000	
	Sig.	578	651	542	451	539	525	408	263		
Volume of prostheses	CC	421**	314	130	−320*	−297	075	156	1000		
	Sig.	008	052	429	047	067	648	342			
Location prostheses according to patient	CC	040	−255	−107	−169	−232	−174	1000			
	Sig.	788	080	470	251	113	236				
Presence of cysts	CC	016	−089	000	277	216	1000				
	Sig.	913	541	1000	051	133					
Breast sonographic density	CC	040	−022	−081	770**	1000					
	Sig.	781	881	578	000						
Mammo density	CC	−185	−241	−205	1000						
	Sig.	199	092	154							
Location prostheses on mammo	CC	042	291*	1000							
	Sig.	771	040								
Mammo quality OBL	CC	312*	1000								
	Sig.	027									
Mammo quality CC	CC	1000									
	Sig.										

* Correlation is significant at the 0.05 level.
** Correlation is significant at the 0.01 level.
*** 2-Tailed.
**** Correlation coefficient.

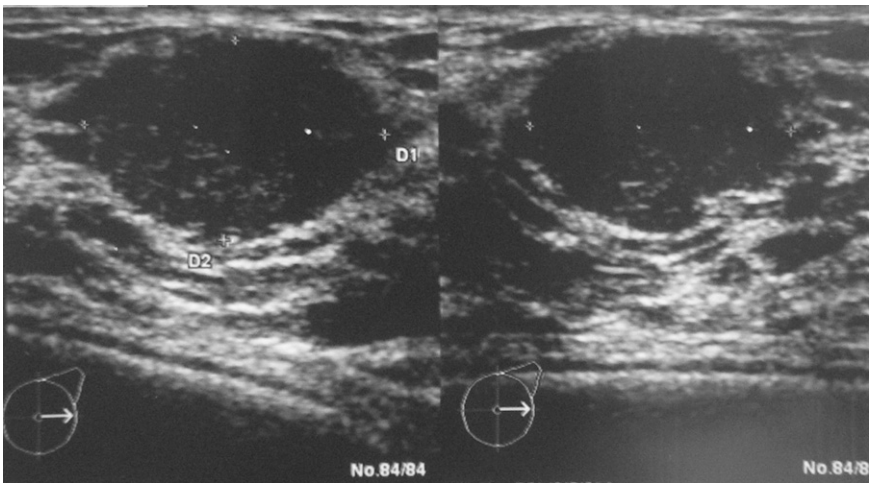

Fig. 3. Sonography of a fibroadenoma in a transsexual woman.

4. Discussion

Breast cancer is uncommon in men, accounting for <1% of all male malignancies. Unlike female breast cancer, for which incidence rates are rising throughout the world, the comparative incidence of male breast cancer has remained relatively stable in most countries [7]. It is not unlikely however that in transsexual women, which for the most part receive life-long estrogen therapy, the risk of developing breast cancer will prove to be higher than for their male counterparts. So far, reports of transsexual women developing breast cancer are scarce [8–10]. However there might be an important degree of under-reporting.

In Belgium all women between the ages of 50 and 69 are invited for a screening mammography on a two-yearly basis. Mean age of the women in our study was 43 years with 35 women >40 (70%) and 12 >50 years of age (24%). Although we did not specifically ask if they ever received an invitation for screening, 5 transsexual women of >50 years of age indicated that they remembered receiving one but had not dared to go. Three women actually had a screening mammography, while 1 patient called the mammography service to which she was invited to but was told that, since she was transsexual, screening did not apply for her.

Women with breast implants are not at a higher risk of developing breast cancer [11]. Equally women with breast implants are not diagnosed at a later stage, do not have more recurrences and have no shorter survival [12]. However it has been shown that the sensitivity of screening mammography in detecting breast cancer is lower in biological women with breast implants although the false-positive rate is not augmented [13,14]. Miglioretti et al. in turn showed that invasive breast tumors in women with implants are prognostically equal to similar tumors in patients without implants [13].

Pain during mammography can discourage women to attend a screening mammography. Moreover, if the first mammography is painful this is cited as the main reason for not re-attending the next screening visit [15]. Compared to women without implants, those with breast implants do not expect mammography to be more painful neither do they experience more pain during the mammography [16]. In our study both expected pain (4.37) and experienced pain (2.00) were judged fairly low. Moreover there is no significant difference in expected pain between those who already had mammography and those who did not. There is however a significant positive correlation between expected and experienced pain. This confirms findings in many other studies: expected discomfort, whether or not from own experience, is an important risk factor associated with pain during mammography [15].

A striking finding in our study is that about one in 4 patients is not aware of the type of breast prosthesis that was used and four out of five do not know the position of the prostheses in relation to the pectoral muscles. However most of these patients were treated by the same surgeon and this surgeon indicates that patients received ample information about the type and location of the prosthesis. Moreover all patients signed a written informed consent form. It is generally recognized that, regardless of the amount of written and verbal information provided to patients, retention of that information is limited [17]. However, to the best of our knowledge, this has never been shown in patients who undergo breast augmentation.

As we expected, few abnormalities were diagnosed by mammography and breast sonography. Nevertheless one fibroadenoma was suspected while this had only been described twice in transsexual women and is extremely rare in the male breast [18,19]. Since in our patient the fibroadenoma was small (1.3 cm) and had perfectly benign features on echography we decided not to perform a biopsy. A follow-up echography was recommended after 6 months.

Mammography and breast sonography were technically feasible in this population of transsexual women and was very well accepted. To the best of our knowledge this is the first study applying mammography and breast sonography in a group of transsexual women.

5. Conclusion

Our study shows that mammography as well as breast sonography is technically feasible and well accepted in transsexual women. Since both exams were judged as nearly painless, 98% of transsexual women intended to come back if they would be invited. As a result of these findings and since there is uncertainty about the long-term effects of estrogens on the male breast and about the real breast cancer risk of transsexual women, we think that breast screening habits in this population should not differ from those of biological women.

On mammography and breast sonography one abnormality with possible clinical importance was encountered: in 1 patient a fibroadenoma was suspected and follow-up was advocated.

Despite oral and written informed consent patient knowledge about the location and type of prosthesis is poor in transsexual women. Therefore more efforts should be done to inform patients and repetition of this information is probably needed.

Competing interests

Steven Weyers was supported by an unrestricted grant donated by Besins-Healthcare® (Brussels, Belgium).

Conflict of interest

All authors declare that there are no conflicts of interest.

Acknowledgements

The authors would like to thank the other members of the gender team for referral of participants, especially Prof. Dr. P. Hoebeke, Dr. G. De Cuypere, Dr. G. Heylens, Prof. P. De Sutter and Dr. G. T'Sjoen. We also thank all volunteers who participated as study subjects.

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